



DEC 13 2005

10 CFR § 50.73
L-2005-255

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: Turkey Point Unit 3
Docket No. 50-250
Reportable Event: 2005-005-00
Date of Event: October 15, 2005
Manual Reactor Trip due to Decrease in the 3C Steam Generator Level

The attached Licensee Event Report 50-250 / 2005-005-00 is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(iv)(A) to provide notification of the subject event.

If there are any questions, please call Mr. Walter Parker at (305) 246-6632.

Very truly yours,

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

SM
Attachment

cc: Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Turkey Point Unit 3

2. DOCKET NUMBER

05000250

3. PAGE

1 OF 6

4. TITLE

Manual Reactor Trip Due To Decrease in the 3C Steam Generator Level

5. EVENT DATE

| MONTH | DAY | YEAR |
|-------|-----|------|
| 10 | 15 | 2005 |

6. LER NUMBER

| YEAR | SEQUENTIAL NUMBER | REV NO. |
|------|-------------------|---------|
| 2005 | - 005 - | 00 |

7. REPORT DATE

| MONTH | DAY | YEAR |
|-------|-----|------|
| 12 | 13 | 2005 |

8. OTHER FACILITIES INVOLVED

FACILITY NAME

DOCKET NUMBER

FACILITY NAME

DOCKET NUMBER

9. OPERATING MODE

1

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)

☐ 20.2201(b)☐ 20.2203(a)(3)(i)☐ 50.73(a)(2)(i)(C)☐ 50.73(a)(2)(vii)☐ 20.2201(d)☐ 20.2203(a)(3)(ii)☐ 50.73(a)(2)(ii)(A)☐ 50.73(a)(2)(vii)(A)☐ 20.2203(a)(1)☐ 20.2203(a)(4)☐ 50.73(a)(2)(ii)(B)☐ 50.73(a)(2)(vii)(B)☐ 20.2203(a)(2)(i)☐ 50.36(c)(1)(i)(A)☐ 50.73(a)(2)(iii)☐ 50.73(a)(2)(ix)(A)☐ 20.2203(a)(2)(ii)☐ 50.36(c)(1)(ii)(A)☒ 50.73(a)(2)(iv)(A)☐ 50.73(a)(2)(x)☐ 20.2203(a)(2)(iii)☐ 50.36(c)(2)☐ 50.73(a)(2)(v)(A)☐ 73.71(a)(4)☐ 20.2203(a)(2)(iv)☐ 50.46(a)(3)(ii)☐ 50.73(a)(2)(v)(B)☐ 73.71(a)(5)☐ 20.2203(a)(2)(v)☐ 50.73(a)(2)(i)(A)☐ 50.73(a)(2)(v)(C)☒ OTHER☐ 20.2203(a)(2)(vi)☐ 50.73(a)(2)(i)(B)☐ 50.73(a)(2)(v)(D)Specify in Abstract below
or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME

Stavroula Mihalakea - Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

305-246-6454

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

| CAUSE | SYSTEM | COMPONENT | MANU- FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU- FACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|-------------------|-----------------------|-------|--------|-----------|-------------------|-----------------------|
| B | SJ | FC | | | | | | | |

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO15. EXPECTED
SUBMISSION
DATE

MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 0702 hours on October 15, 2005, the Turkey Point Unit 3 Reactor was manually tripped from 99.9 % power due to a decrease in the 3C Steam Generator (SG) level. The loss of SG level control was due to feedwater [SJ] control system malfunctions. At approximately 0701 hours, the 3C SG level started to decrease. The main feedwater flow control valve, FCV-3-498, [SJ:FCV] would not modulate open even in manual control. Subsequent to the trip, Operations closed the Main Steam Isolation Valves (MSIVs) in response to observing that one of the four steam to reheat isolation valves did not close. Closure of the MSIVs [SB:ISV] resulted in loss of the normal heat removal path. The root cause of losing control of FCV-3-498 was found to be insufficient work instructions that allowed the valve clip in the positioner to be installed with some looseness. Corrective actions include the replacement of the valve positioner for FCV-3-498, and revision to the inspection instructions to include explicit installation details. This event had no adverse effect on the operating crew's ability to safely shutdown the reactor. Therefore, this event did not adversely affect the health and safety of the public.

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DESCRIPTION OF THE EVENT

At 0702 hours on October 15, 2005, the Turkey Point Unit 3 Reactor was manually tripped from 99.9 % power due to a loss of level control in the 3C Steam Generator (SG). The loss of level control was a result of a feedwater control system malfunction. Prior to the trip, at approximately 0700 hours, the 3A SG feed flow and steam flow mismatch alarms were annunciated in the control room. The Reactor Operator (RCO) noticed that the 3A SG feed flow indicator, FI-3-476, [SJ:FI] indication was erratic and the 3A SG level was decreasing. After taking manual control of the 3A SG level controller, the level was stabilized at 55%. At approximately 0701, the 3C SG level was noted to be decreasing. The RCO took manual control of the 3C SG level controller in an attempt to restore level. The main feedwater flow control valve, FCV-3-498, did not respond to the controller output and it would not modulate open, in automatic or in manual control. A manual reactor trip was initiated when the 3C SG level was at approximately 20% narrow range.

After manually tripping the reactor, the operators observed that one of the four main steam to reheat (MSR) isolation valves, MOV-3-1432, [SB:SEP, isv] failed to close on demand following the turbine trip. As a result, Operations manually closed all Main Steam Isolation Valves (MSIVs) at approximately 0705 hours. Operations personnel indicated that dual indication was obtained on the initial closing stroke of MOV-3-1432. The valve was also observed locally to be almost at the full open position. The Operators subsequently took the local valve operator to manual mode and the valve was closed completely. This reactor trip is considered an unplanned reactor trip with the loss of normal heat removal path due to closing the Main Steam Isolation Valves (MSIVs), prior to establishing reactor conditions that allow the use of the plant's normal long term heat removal system.

There were no safety systems out of service prior to the event. All control rods were inserted as expected. The Auxiliary Feedwater System actuated as expected when the 3C SG level decreased below 10% narrow range.

Following the reactor trip, all other plant systems functioned as designed. Therefore, this event did not challenge or adversely affected the health and safety of the public.

ANALYSIS OF THE EVENT

An event response team was formed to investigate the cause of the feedwater control system malfunctions and to ensure that corrective actions to prevent recurrence were identified and implemented prior to Turkey Point Unit 3 returning to service.

The first control room indication of the feedwater system malfunction observed prior to the reactor trip was the 3A Steam Generator feed flow steam flow mismatch. Specifically, the output of the

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FT-3-476, Steam Generator Feed Flow transmitter was erratic, resulting in inadequate 3A SG level control in the automatic mode. Operations placed the 3A Steam Generator Feedwater Control Valve in manual control, and they were successfully restoring 3A SG level, when the 3C feedwater control valve failed. Troubleshooting of the Feedwater Flow instrument loop F-3-476 found that the Optimac Analog Computer module's internal power supply had failed high. The cause of the power supply failure was determined to be failure of transistor Q2, which indirectly caused the power supply output to go to its maximum value resulting in module failure due to a condition of excessive voltage and current. The failed module was replaced. It was determined that failure of this component alone would not have resulted in a reactor trip. This component is a redundant protection channel and the control function is recoverable by placing the SG level control to manual or swapping control to the alternate channel.

Responding to the feedwater flow demand due to the low level transient in the 3A SG, the 3C feedwater control valve, FCV-3-498, experienced a failure that resulted in the uncontrolled level reduction in the 3C SG, which then lead to Unit 3 being manually tripped. Troubleshooting found that the valve positioner for FCV-3-498 had failed. The positioner was removed and replaced with a new one. The valve positioner had failed due to the internal pilot valve disengagement from the balance beam. The pilot valve became disengaged since the valve clip, which applies the force needed to keep the pilot valve stem in contact with the balance beam, fell off. It was found that the pilot valve stem, the valve clip and the balance beam were significantly worn. The diminished overall length of the pilot valve allowed the valve clip to become detached. The spring-like clip might have been stretched during installation and the pilot valve was not aligned perpendicular to the balance beam as required. It is believed that vibration of the valve mounted positioner and initial looseness of the valve clip allowed the parts to abrade each other causing material to be lost. The vibration is due to the high energy mass flow rate through the feedwater regulating valves. Subsequent to this event, the manufacturer has communicated the requirements for proper alignment and tightness for these parts. Upon review of the event analysis, it is concluded that the failure of FCV-3-498 was due to a dislodged valve clip in the valve positioner. The team reviewed the work package which replaced the positioner for FCV-3-498. It included instructions to "install the valve clip onto the valve stem" and provided an illustration. It also included a step to "verify the valve clip is properly installed prior to the final installation of the cover". However, the work instructions fell short of specific instructions for verification of seating the valve clip in the balance beam cup and checking for looseness.

CAUSE OF THE EVENT

The cause of the trip was loss of control of feedwater control valve FCV-3-498. The failure of FCV-3-498 was due to a dislodged valve clip in the ABB AV1 valve positioner. The root cause of the loss of control of FCV-3-498 (and ultimately the reactor trip) is insufficient work instructions that allowed the valve clip to be installed with some amount of looseness.

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Contributing to the failure is the delicate design of the valve clip itself, as it is a thin steel wire, which is easily deformed by hand and exhibited signs of wear erosion at the contact point with the valve stem.

The loose fitting valve clip allowed normal system vibrations to cause movement of the associated parts in relation to each other. This movement resulted in excessive wear on the positioner parts further increasing looseness until the valve clip fell off during the transient initiated by the failed 3A feedwater flow module.

GENERIC IMPLICATIONS

The manufacturer's technical manual as well as the work package instructions did not include adequate details to properly install the pilot valve assembly and valve clip. The need for detailed assembly instructions was recognized. This failure is generic to the product (ABB model AV1 positioners). ABB provided dimensional specifications regarding the valve clip and recommended inspections of the affected positioners. Details regarding this event have been shared with the appropriate FPL personnel at St. Lucie and Seabrook stations.

EXTENT OF CONDITION

The positioner is an ABB Model AV1 that is also utilized on numerous other valves at Turkey Point. The Unit 3 and Unit 4 main and bypass feedwater flow control valves as well as the Steam Dump to Condenser valves are located in high vibration areas. The valve clips for these valves have been inspected.

HUMAN PERFORMANCE REVIEW

The spring clip may have been stretched out of tolerance during installation or may have been incorrectly installed. Both of these factors could be considered as human errors. Measurement of the clip's dimensions found the clip stretched. Additionally, review of the work instructions found that they lacked sufficient detail and emphasis to provide adequate guidance to the journeymen performing positioner installation and maintenance. Consequently, the valve clip might have been inadvertently stretched during installation and tightness verification was not recognized as a required step. The fact that adequate work instructions were not provided is a Human Performance error.

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REPORTABILITY

A review of the reporting requirements of 10 CFR 50.72 and 10 CFR 50.73 and NRC guidance provided in NUREG-1022, Revision 2, Event Reporting Guidelines 10 CFR 50.72 and 10 CFR 50.73, was performed for the subject condition. As a result of this review, the condition is reportable as described below.

This event is reportable in accordance with 10CFR50.73(a)(2)(iv)(A), due to the actuation of the reactor protection system 10CFR50.73(a)(2)(iv)(B)(1), MSIV closure 10CFR 50.73(a)(2)(iv)(B)(2), and AFW system actuation 10CFR 50.73(a)(2)(iv)(B)(6).

ANALYSIS OF SAFETY SIGNIFICANCE

This event was reportable under 10 CFR 50.73(a)(2)(iv)(A) and (B) as an event that resulted in manual or automatic actuation of the reactor protection system, initiation of the auxiliary feedwater system and manual isolation of the MSIVs.

The loss of feedwater is an analyzed event. The Updated Final Safety Analysis Report (UFSAR), analysis assumes a loss of normal feedwater to all three steam generators due to the loss of feedwater pumps or valve malfunctions. In the October 15, 2005 event, malfunctions of the 3C SG feedwater flow control valve resulted in an uncontrolled level reduction in the 3C Steam Generator. Operations manually tripped the reactor prior to allowing the 3C SG level to reach the Low-Low SG level (automatic trip) setpoint. Subsequent to the reactor trip, plant instrumentation designed to monitor this event actuated and performed as required, placing the reactor in a safe condition. Closure of the MSIVs prior to establishing reactor conditions that allow the use of the plant's normal long term heat removal system, resulted in loss of the normal heat removal path. Operations used the steam dump to atmosphere (SDTA) valves to control the reactor coolant system temperature.

The October 15, 2005 event is bounded by the total loss of normal feedwater event analyzed in the UFSAR. Therefore, it can be concluded that the event did not compromise the health and safety of the public.

CORRECTIVE ACTIONS

1. The positioner inspection/installation instructions have been revised to include more explicit detail regarding pilot valve alignment to the balance beam and valve clip installation/tightness.
2. A quarterly visual inspection of the valve clip and balance beam configuration will be performed.
3. The positioners located at high vibration areas will be replaced by an upgraded design.

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POTENTIAL REPEAT OCCURENCE REVIEW

A data base search for Turkey Point found no similar events. This is not considered a repeat occurrence.

ADDITIONAL INFORMATION

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE system identifier, component function identifier, second component function identifier (if appropriate)].